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Light quality and efficiency of solid state lighting products

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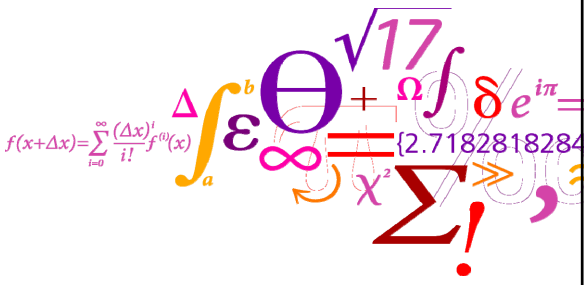
Light quality and efficiency of solid state lighting products

Carsten Dam-Hansen, DTU Fotonik



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Contents

- **Status on light quality and efficiency**
  - **LED packages**
  - **SSL products**
- **SSL performance**
  - **lighting quality program, Denmark**
  - **Australia**
- **Need for international harmonisation**
- **IEA SSL Annex**
- **IC2013 International Laboratory Comparison**
- **International test standard**
- **Temporary and ideal scheme for SSL world**

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Current status, LED packages

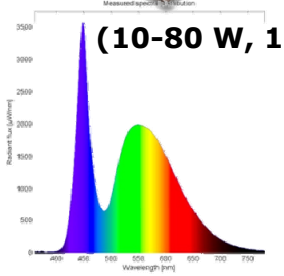
Packaged LEDs

3 mm

(~ 1-5 W, ~400 lm)

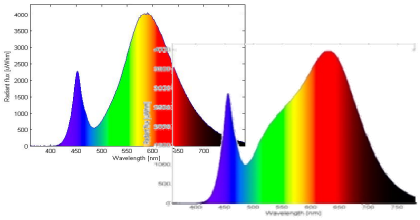
Color temperature

2700 - 3500 K **> 5000 K**



(10-80 W, 1500-6000 lm)

Efficiency:
123 lm @ 350 mA ~ 117 lm/W



160 lm @ 350 mA ~ 152 lm/W (@ 25 °C)
139 lm @ 350 mA ~ 132 lm/W (@ 85 °C)

Lab results: 231 lm/W

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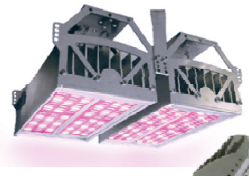
Current status, SSL products

SSL products is based on LED packages including optics, heatsink, control gear

Retrofit products

LED lamps/luminaires

50-80 lm/W



~ 100 lm/W

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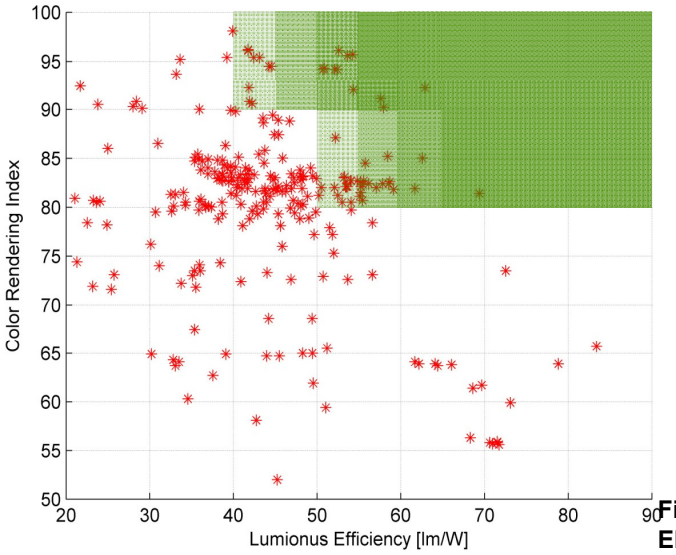
LED lighting quality program

Efficiency and color rendering of approx. 100 products, 2010-2012



Finansed by Danish Energy Association, Elforsk (PSO 342-035)

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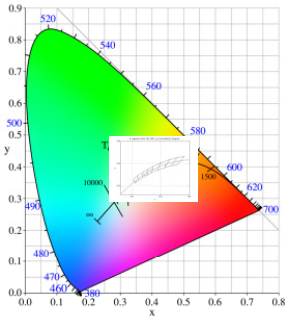
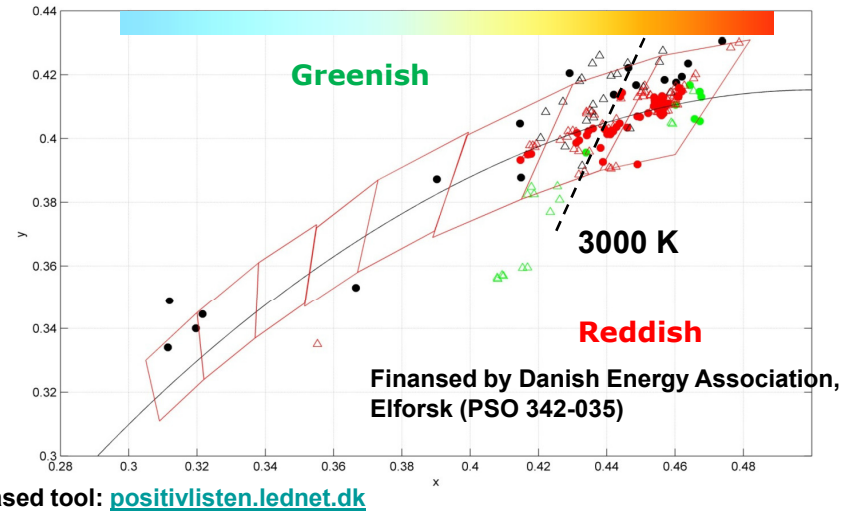
LED lighting quality program

Efficiency and color rendering of app. 100 products, 2010-2012





Finansed by Danish Energy Association, Elforsk (PSO 342-035)

Compiled in a new web-based tool: positivlisten.lednet.dk

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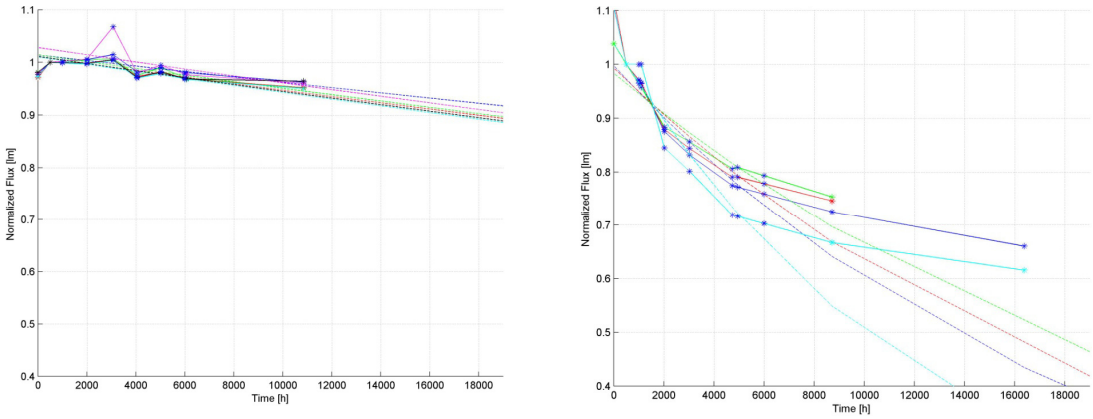
LED lighting quality program

Lumen and color maintenance measurement over 6000 h, extrapolation to max. 36.000 h

No standard for this only for LED packages



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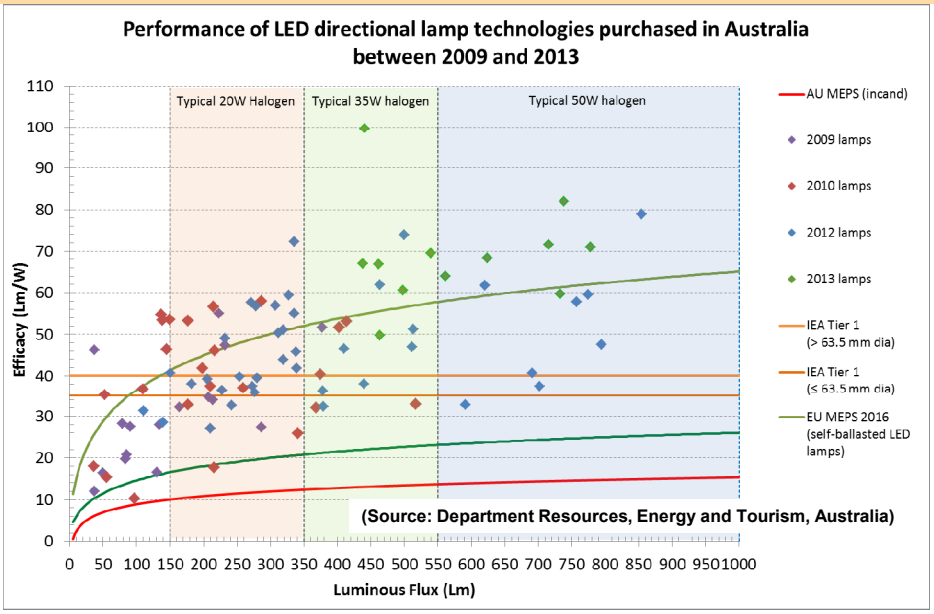
Australia



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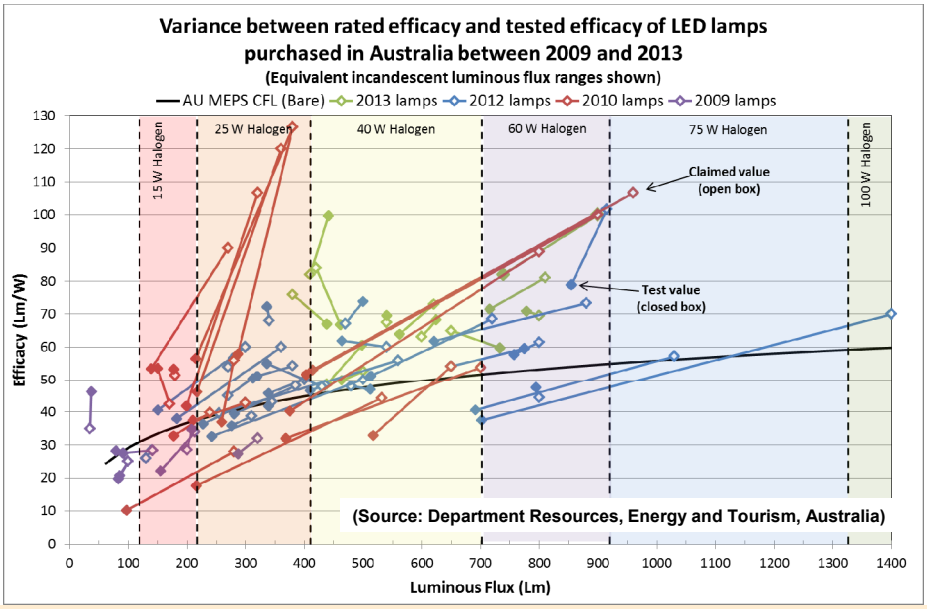
Australia, Claim vs. Test



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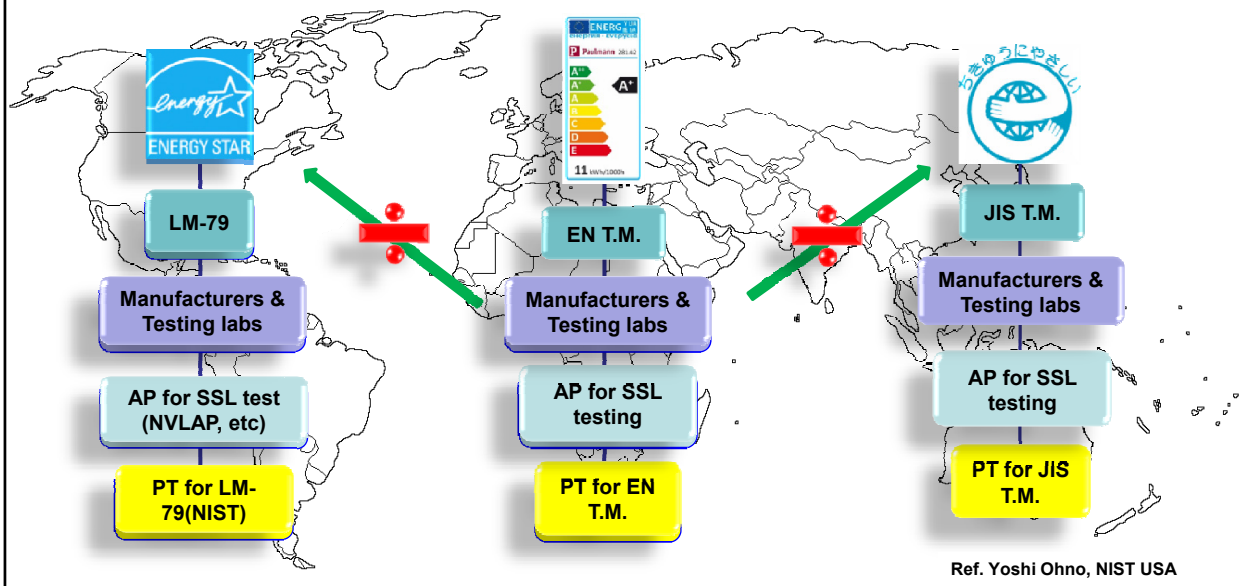
Need for international harmonisation



Ref. Yoshi Ohno, NIST USA

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IEA SSL Annex

IEA SSL Annex, 2010-2014

Efficient Electrical End-Use Equipment
International Energy Agency

Aim is to provide "tools" for governments to assess the performance of SSL products harmonise test methods and accreditation

1) **Develop performance criteria for quality assurance in SSL products, published on http://ssl.iea-4e.org/task-1-quality-assurance**
2) **Determine the robustness of SSL test procedures through international laboratory testing campaigns (IC2013)**
3) **Recommend suitable accreditation frameworks for SSL testing laboratories.**

To increase confidence in SSL products in the marketplace

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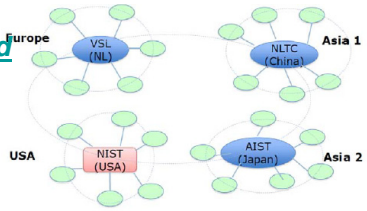
IC2013

IEA 4E SSL Annex, 2013 Interlaboratory Comparison open Oct. 2012 for all countries

Defining the most stringent SSL test procedure,

IEA 4E SSL Annex Interlaboratory Comparison Test Method version 1.0



Star type measurement campaign on 5-6 difficult to measure LED artefacts.

Closed in Sept. 2013,

54 labs from 17 countries participated + 4 nucleous + 35 linked labs = grand total of 93 labs incl. 2 danish labs.

Designed to be recognized as Proficiency Testing for any SSL test method

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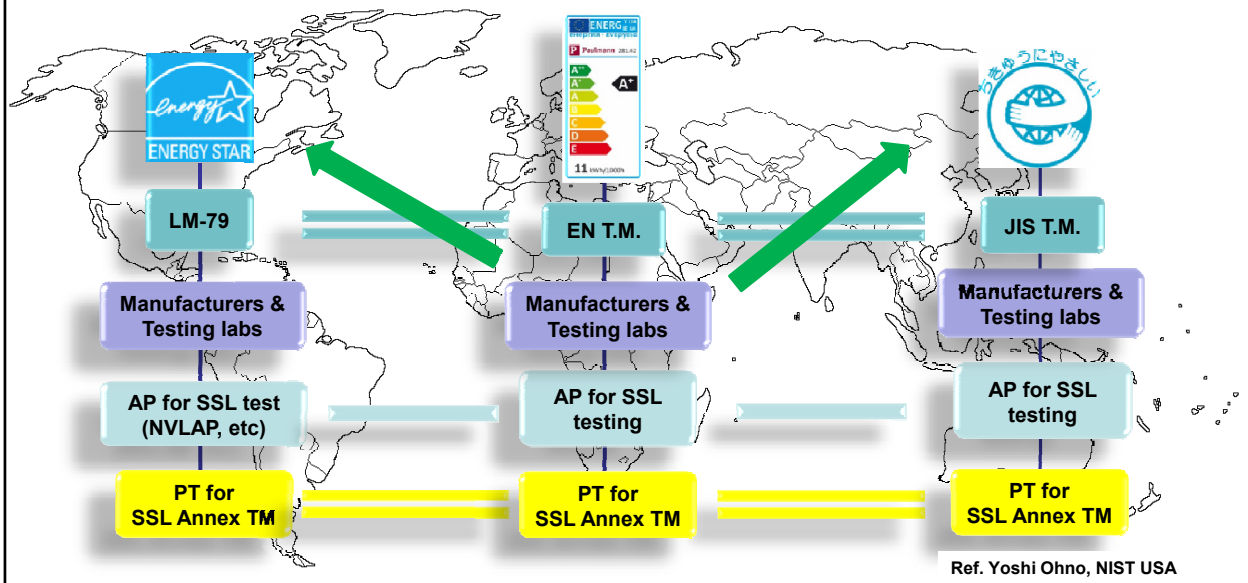
Temporary scheme of the SSL world



Ref. Yoshi Ohno, NIST USA

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International Test Standard

There is an urgent need for an international test standard for SSL products

CIE TC2-71, Chair, Yoshi Ohno (US)
CEN TC169 WG7, Chair, Guy Vandermeersch (BE)

jointly developing the draft:

EN 13032 Lighting Applications — Measurement and presentation of photometric data of lamps and luminaires — Part 4: LED lamps, modules and luminaires

CIE S-xx Standard on Test Method for LED lamps, luminaires, and modules

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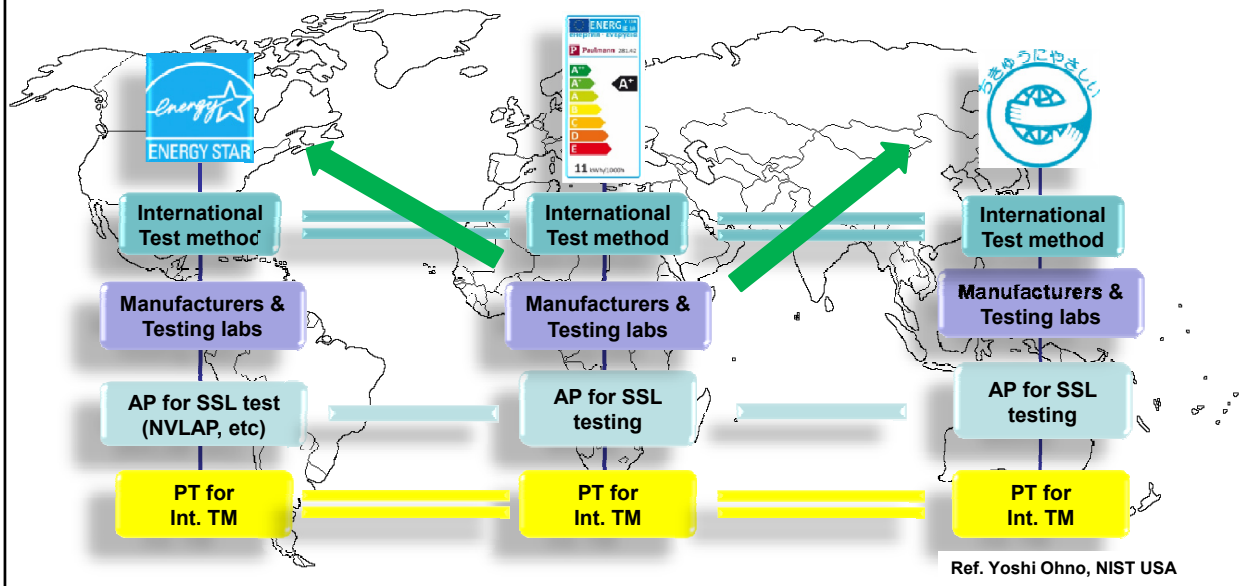
Ideal scheme of the SSL world



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